Small Business Innovation Research/Small Business Tech Transfer

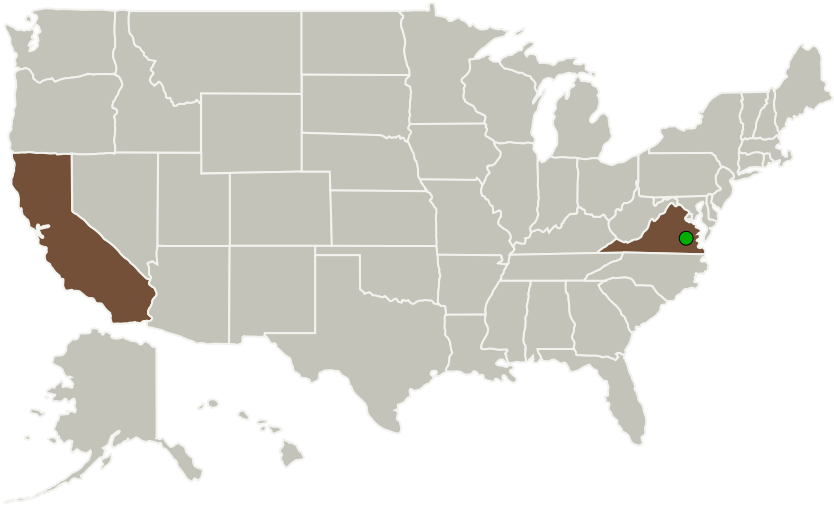
Defining Handling Qualities of Unmanned Aerial Systems, Phase II

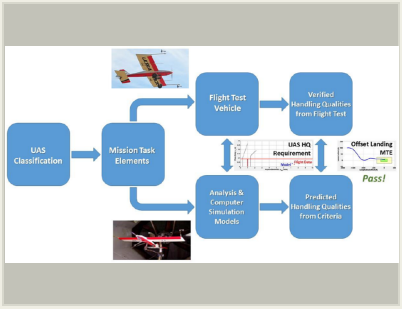
Completed Technology Project (2017 - 2019)

Project Introduction

Unmanned Air Systems (UAS) are no longer coming, they are here, and operators from first responders to commercial operators are demanding access to the National Airspace System (NAS) for a wide variety of missions. This includes a proliferation of small UAS that will operate beyond line of sight at altitudes of 500 ft and below. Currently the UAS arena includes traditional airframers, established UAS manufacturers, hobbyists, academic institutions, and many air vehicle newcomers such as Amazon, Google, and Facebook that see UAS as a means to other commercial ends. A myriad of issues continues to slow the development of verification, validation, and certification methods that will enable the safe introduction of UAS to the NAS. These issues include the lack of both a consensus UAS categorization process and quantitative certification requirements including the definition of handling qualities. The how to of safely integrating UAS in the NAS raises many questions, and to date, there have been few answers. Perhaps the problem is too big. Because of a lack of quantitative data, attempts to address core problems thus far have failed to achieve consensus support. This Phase II program does not propose to tame the entire verification, validation, and certification problem, but instead to address the important need to define UAS handling qualities in piloted, pilot monitoring, and autonomous operations via a mission-oriented approach with an end product being the UAS Handling Qualities Assessment software toolbox (UAS-HQ) and corresponding specification that will guide UAS stakeholders through a systematic evaluation process. This process will be validated in Phase II via full flight envelope testing of a fixed wing UAS and low/speed hover flight regime testing of a multi-rotor UAS.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Systems Technology, Inc	Lead Organization	Industry	
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Transitions

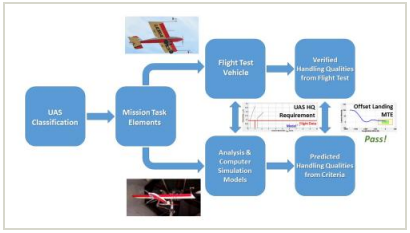
April 2017: Project Start

April 2019: Closed out

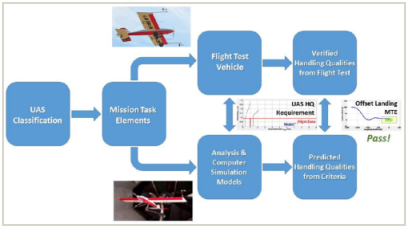
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140986)*

Images



Briefing Chart Image
Defining Handling Qualities of Unmanned Aerial Systems, Phase II Briefing Chart Image *(https://techport.nasa.gov/image/128431)*



Final Summary Chart Image
Defining Handling Qualities of Unmanned Aerial Systems, Phase II *(https://techport.nasa.gov/image/135466)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Systems Technology, Inc

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

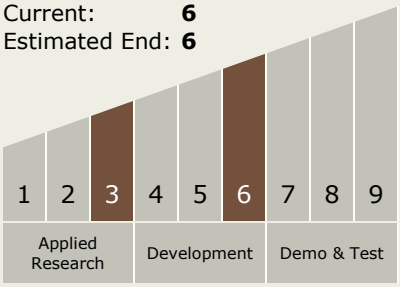
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
David H Klyde

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



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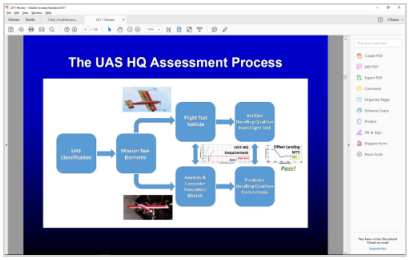

Final Summary Chart Image
Defining Handling Qualities of Unmanned Aerial Systems, Phase II *(https://techport.nasa.gov/image/132816)*

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.3 Simulation
    - TX11.3.3 Model-Based Systems Engineering (MBSE)

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System